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| EXAMINER |
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ORLANDO, MICHAEL N

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1791

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08/17/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/758,250

**Applicant(s)**

CARPER ET AL.

**Examiner**

MICHAEL N. ORLANDO

**Art Unit**

1791

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 16 April 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 12-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 12-24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SF/ICE)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

### DETAILED ACTION

The arguments and amendments submitted 04/16/2009 have been fully considered and the 112 rejection is hereby withdrawn. The merits of the claims, however, remain unpatentable over the prior art as set forth below.

#### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
  2. Ascertaining the differences between the prior art and the claims at issue.
  3. Resolving the level of ordinary skill in the pertinent art.
  4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 12-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Steibel et al. 6,280,550 in view of JP 6-137103, Baldwin et al. 5,049,036 and Steibel et al. 6,258,737.

Regarding claims 12-20, Steibel et al. 6,280,550 discloses a method of making a composite turbine blade comprising: providing first reinforcement comprising an insert preform of silicon carbide fabric rigidized by deposited silicon carbide (silicon carbide-silicon carbide composite preform having porosity); optionally depositing matrix material to fill only a portion of the porosity of the insert preform (silicon-silicon carbide composite preform having some porosity); providing second reinforcement comprising silicon carbide fabric plies (outer shell preform); applying the silicon carbide fabric plies to contact the insert preform and define the surface shape of the blade; and depositing matrix material into the porosity of the first and second reinforcement, the depositing also providing bonding between the first and second reinforcements. Matrix material may be deposited by melt infiltration of silicon so that the matrix is silicon carbide or mixture of silicon and silicon carbide. As shown in Figure 7, the insert is provided in the dovetail section of the blade (col. 2-7). Steibel et al. do not specifically disclose providing the second reinforcement as plies of silicon carbide prepreg cloth or disclose providing the composite turbine blade with a dovetail section by inserting an insert preform in the dovetail section. The term solid is taken to be satisfied by the fact that

the walls of the core are solid. Note that Steibel also acknowledges that both entirely solid and hollow articles may be produced (column 2).

JP 6-137103 teaches that a fiber reinforced composite turbine blade, such as of fiber strengthening ceramic (ceramic matrix composite), is made with a dovetail section using reinforcing fiber which extended from the dovetail section to the blade part (Abstract and computer translation).

Baldwin teaches that in making composite airfoils (fan blades), inserts or "preforms" are provided in both the blade part to form the core of the blade and in the root part (dovetail) of the blade. The preform inserts are made to be of the same composite material as the composite material layered over the inserts to form the composite blade. Using insert enhances producibility and eliminates the hundreds of prepreg layers, especially in the thick root sections (col. 2, lines 13-57, col. 4, lines 44-46).

Steibel et al. '737 teaches that in making a silicon carbide composite by melt infiltration with silicon, the silicon carbide fiber fabric is impregnated with high char yield slurry to form a prepreg before melt infiltration. The use of a high char yielding resin improves increases burn-out strength, produces a hard, tough preform and provides integrity to the preform structure during silicon melt infiltration. Steibel et al. further teach that before melt infiltration, the impregnated fabric (prepregged cloth) is either subjected to compression molding, bladder molding or autoclaving to form a preform for melt infiltration. Steibel et al. also teach that carbon of micrometer particle size provided in

silicon carbide preforms to give different composite properties of structure (col. 5, line 50 - col. 6, line 11, col. 6, line 64 - col. 7, line 12).

It would have been obvious to one of ordinary skill in the art to have modified the method of Steibel et al. for making a composite turbine blade by making the turbine blade with a dovetail section, as taught by JP ' 103 as provided as part of a turbine blade and also made during the fabrication of a fiber reinforced composite blade. Providing the fabric plies (outer shell section preform) to extend from the blade part to a dovetail section to form both the blade and dovetail section of a turbine blade in one step of matrix deposition would have been obvious to one of ordinary skill in the art, as JP ' 103 teaches that the reinforcing fiber for a turbine blade extends from the blade to the dovetail section.

Providing an insert preform not only in the blade section but also in the dovetail section would have been obvious to one of ordinary skill in the art, as Baldwin teaches that a composite fan blade having a root part (dovetail) is provided with insert (insert preform) not only in the blade part but also in the dovetail part in order to enhance producibility and reduce the number of prepreg layers, especially in the thick dovetail section. Providing an insert (insert preform) in the dovetail section as silicon carbide fabric rigidized by deposited silicon carbide (silicon carbide- silicon carbide composite preform having porosity), or silicon-silicon carbide composite preform having some porosity, would have been obvious to one of ordinary skill in the art to provide an insert preform in the dovetail section similar to that provided in the blade section to allow for deposition of matrix by silicon melt infiltration and bonding between the preform and the

fabric plies, as disclosed by Steibel et al. It would have been obvious to one of ordinary skill in the art that, in making a silicon carbide-silicon carbide composite turbine blade using insert preforms in both the blade part and dovetail part, to provide the insert preforms as similar in composition to each other and to the fabric plies which are to contact the insert preforms, as Baldwin et al. teach that the insert in the blade part and dovetail part are similar in composition and to that of the prepreg layers (plies) to enhance producibility and to reduce the number of prepreg layers required, especially in the thick dovetail part of the blade. The use of the same type of insert preform in the dovetail section as used in the blade section would have been obvious to one of ordinary skill in the art, as clearly suggested by Baldwin, to make a composite blade.

It would have been obvious to one of ordinary skill in the art to have further modified the method of Steibel et al. for making a composite turbine blade by providing the second reinforcement as impregnated with high char yielding slurry (prepregged or a preform) before contacting the insert preform, as taught by Steibel et al. '737, as impregnated in silicon carbon fiber fabric before silicon melt infiltration to increase burn-out strength, produce a hard, tough preform and provide integrity during silicon melt infiltration.

Autoclaving the assembly of second reinforcement prepreg and insert preform before silicon melt infiltration, as claimed in Claim 12, would have been obvious to one of ordinary skill in the art, as taught by Steibel et al. '737, to aid in forming the prepreg into preform shape before melt infiltration. It would have been obvious to have autoclaved to help shape the prepregged plies into the surface shape of the blade.

Providing the silicon-silicon carbide insert preform with carbon microspheres, as claimed in Claims 14 and 19, would have been obvious to one of ordinary skill in the art, as taught by Steibel et al. '737, as added to silicon carbide preforms to give different composite properties of structure. The use of carbon microspheres in either of the insert preform or second reinforcement preform would have been obvious to one ordinary skill in the art depending on desired composites properties of the insert or the surface of the composite turbine blade.

Regarding claims 20 and 21, Steibel 6,280,550 discloses the insert being prepared and rigidized prior to the application of the second layer (figure 1; columns 3 and 4). This prior preparation is taken to be a pre-fabrication. In addition the examiner notes that even if such a teachings was not explicitly stated it would have been obvious nonetheless absent a showing of unexpected results because essentially the same end product would have been produced. Note that the courts have held that selection of any order of performing process steps is *prima facie* obvious in the absence of new or unexpected results (*In re Burhans*, 154 F.2d 690, 69 USPQ 330 (CCPA 1946)) and have further upheld that the disparity between simultaneous and sequential steps is likewise an obvious matter absent a showing of unexpected results (*New Wrinkle v. Marzall* 93 USPQ 92, *New Wrinkle v. Watson* 96 USPQ 436)).

Regarding claims 23 and 24, Steibel 6,280,550 discloses the thickness of the product is defined by strength considerations and that such thickness is allocated between the two layers (i.e. insert and overlay) (column 6). Clearly it is expected that increase in the thickness of one of the rigidized layer results an increased strength of



said layer. Steibel discloses that typically about half of the total number of plies is in each of the layers. Steibel therefore typically utilizes about similar strengths for the insert and outer shell. The examiner notes that by use of the term typically and about Steibel is recognizing that variations both occur and can be used as viable options so therefore a slightly stiffer insert (based upon a slight increase in ply thickness) is not out of the scope of Steibel's disclosure. Steibel recognizes that a variation such as one with a stiffer insert would be viable and accomplished via utilizing of a larger number of plies used in the insert compared to the overlay. Also note in this case Steibel recognizes that ply thickness is a result effective variable affecting the strength of the layers and it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). The courts held that the normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges (i.e. varying the relationship from near 50/50 and in either direction therefrom) is the optimum combination of percentages (*Peterson*, 315 F.3d at 1330, 65 USPQ2d at 1382).

4. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as obvious over Steibel et al. 6,280,550 in view of JP 6-137103 and Baldwin et al. 5,279,892.

Steibel et al. 6,280,550 discloses a method of making a composite turbine blade comprising: providing first reinforcement comprising an insert preform of silicon carbide fabric rigidized by deposited silicon carbide (silicon carbide-silicon carbide composite preform having porosity); optionally depositing matrix material to fill only a portion of the

porosity of the insert preform (silicon-silicon carbide composite preform having some porosity); providing second reinforcement comprising silicon carbide fabric plies (outer shell section preform); applying the silicon carbide fabric plies to contact the insert and define the surface shape of the blade; and depositing matrix material into the porosity of the first and second reinforcement, the depositing also providing bonding between the first and second reinforcements. Matrix material may be deposited by melt infiltration of silicon so that the matrix is silicon carbide or mixture of silicon and silicon carbide (col. 2-7). Steibel et al. do not disclose providing the composite turbine blade with a dovetail section by inserting an insert preform in the dovetail section.

JP 6-137103 teaches that a fiber reinforced composite turbine blade, such as of fiber strengthening ceramic (ceramic matrix composite), is made with a dovetail section using reinforcing fiber which extends from the dovetail section to the blade part (Abstract and computer translation).

Baldwin teaches that in making composite airfoils (fan blades), inserts or "preforms" are provided in both the blade part to form the core of the blade and in the root part (dovetail) of the blade. The inserts are made to be of the same composite material as the composite material layered over the inserts to form the composite blade. Using inserts enhance producibility and eliminate hundreds of prepreg layers, especially in the thick root sections (col. 2, lines 13-57, col. 4, lines 44-46).

It would have been obvious to one of ordinary skill in the art to have modified the method of Steibel et al. for making a composite turbine blade by making the turbine blade with a dovetail section, as taught by JP ' 103, as provided as part of a turbine

blade and also made during the fabrication of a fiber reinforced composite blade.

Providing the fabric plies (outer shell section preform) to extend from the blade part to a dovetail section to form both the blade and dovetail section of a turbine blade in one step of matrix deposition would have been obvious to one of ordinary skill in the art, as JP ' 103 teaches that the reinforcing fiber for a turbine blade extends from the blade section to the dovetail section.

Providing an insert preform not only in the blade section but also in the dovetail section would have been obvious to one of ordinary skill in the art, as Baldwin teaches that a composite fan blade having a root part (dovetail) is provided with insert (insert preform) not only in the blade part but also in the dovetail part in order to enhance producibility and reduce the number of prepreg layers, especially in the thick dovetail section. Providing an insert (insert preform) in the dovetail section as silicon carbide fabric rigidized by deposited silicon carbide (silicon carbide- silicon carbide composite preform having porosity), or silicon-silicon carbide composite preform having some porosity, would have been obvious to one of ordinary skill in the art to provide an insert preform in the dovetail section similar to that provided in the blade section to allow for deposition of matrix by silicon melt infiltration and bonding between the preform and the fabric plies, as disclosed by Steibel et al. It would have been obvious to one of ordinary skill in the art that, in making a silicon carbide-silicon carbide composite turbine blade using insert preforms in both the blade part and dovetail part, to provide the insert preforms as similar in composition to each other and to the fabric plies which are to contact the insert preforms, as Baldwin et al. teach that the insert in the blade part and

dovetail part are similar in composition and to that of the prepreg layers (plies) to enhance producibility and to reduce the number of prepreg layers required, especially in the thick dovetail part of the blade. The use of the same type of insert preform in the dovetail section as used in the blade section would have been obvious to one of ordinary skill in the art, as clearly suggested by Baldwin, to make a composite blade.

Further, by providing a second reinforcement of silicon carbide fabric plies for defining the surface shape of the blade and into which silicon can be deposited by melt infiltration, an outer shell preform having at least some porosity is obviously provided.

### ***Response to Arguments***

Applicant's arguments filed 04/16/2009 have been fully considered but they are not persuasive.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). The examiner has indicated that Steibel does not provide all of the limitations of the present invention because otherwise the rejection would be based upon 35 U.S.C. 102. The rejection appropriately takes into account only knowledge of the art at the time of the invention and indicates that the differences between the primary reference and the present claims were known matters. Steibel, the primary reference, is drawn to the art of turbine blades and more particularly the production of such blades by utilizing a

melt infiltration of silicon to produce a composite and the secondary references relied upon establish that the differences between Steibel and the present claims are known matters in the arts of turbine blades and melt infiltrated silicon carbide composites respectively.

While Steibel et al. '550 may not specifically disclose that the composite turbine blade has a dovetail section, such is known in the art of making composite turbine blades, as suggested by JP 6-137103. JP '103 teaches that a fiber reinforced composite turbine blade is made with a dovetail section using reinforcing fiber which extends from the dovetail section to the blade part. The reference is also particularly relevant because it teaches that turbine blades made by such process can be of various fiber strengthening composites such as fiber reinforced plastics (i.e., resin matrix composites), fiber reinforced metal (i.e., metal matrix composites), fiber strengthening ceramic (i.e., ceramic matrix composites) and fiber strengthening carbon (i.e., carbon matrix composites) [0009]. Thus making a turbine blade with a dovetail section is known in the art for all types of composite turbine blades.

Baldwin is pertinent because the reference suggests that it would be obvious to one of ordinary skill in the art to have provided an insert preform not only in the blade section but also in the dovetail section in order to enhance producibility and reduce the number of prepreg layers, especially in the thick dovetail section. Inserts suggested by Baldwin are made to be of the same composite material as the composite material layered over the inserts to form the composite blade, which would have suggested to one of ordinary skill in the art to have used a composite insert preform as disclosed by

Steibel et al. also in the dovetail section. The use of a known technique to improve a similar product in the same way is a matter of obviousness. In this case it would have therefore been obvious to utilize a method known to be useful in the art of composite turbine blades to enhance producibility and reduce the number of prepreg layers to merely enhance producibility and reduce the number of prepreg layers in another type of composite turbine blade.

Applicant argues that Baldwin is not analogous art because the reference is directed to cloth/resin composite blades as compared to ceramic matrix composite made by silicon melt infiltration of Steibel et al. However, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, Baldwin is not only in the field of applicant's endeavor, that being the field of making composite turbine blades, but also reasonably pertinent to the particular problem with which the applicant was concerned, that being how to provide an insert in the dovetail section of the composite turbine blade. Applicant appears to contend that resin matrix composites and ceramic matrix composites made by melt infiltration are so different in processing and are such different fields that teachings such as from the Baldwin reference, which is particularly directed to resin matrix composites, are not relevant to composite processing such as of Steibel, which is particularly directed to ceramic matrix composites. However, not only are both references related to forming composite turbine

blades but also forming composite blades having inserts. The particular composite fields of resin matrix composites and ceramic matrix composites are not as disparate as Applicant contends, and one of ordinary skill in the art of composites is familiar with both resin matrix composite processing and ceramic matrix composite processing.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, providing an insert preform not only in the blade section but also in the dovetail section in order to enhance producibility and reduce the number of prepreg layers, such insert being of the same composite material as the composite material layered over the inserts to form the composite blade, is knowledge which was within the level of ordinary skill at the time the claimed invention was made, as suggested by Baldwin.

The applicant also contends that the term "solid" differentiates from the core of Steibel.

The examiner disagrees that the term "solid" distinguishes from the prior art. In this case the term solid is not defined in a manner to exclude the teachings of Steibel. The walls of Steibel's core are clearly solid and as such Steibel discloses a core that reads upon applicant's presently claimed solid core. Also, note that while Steibel does show hollow cores in the examples (which still reads upon applicant's broad terminology of "solid" due to its physical state) it is also noted that Steibel does appreciate that both solid and hollow articles can be produced (column 2). The term solid is not specific enough to exclude the teachings of Steibel and the examiner has appropriately afforded the claims their broadest reasonable meaning. The examiner cannot read limitations

into the term "solid" that are not specifically presented in the claims or defined in the specification.

### ***Conclusion***

1. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **MICHAEL N. ORLANDO** whose telephone number is (571)270-5038. The examiner can normally be reached on Monday-Thursday, 7:30am-4:30pm, alternate Fridays.



If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Philip C. Tucker can be reached on (571) 272-1095. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MO

/Philip C Tucker/  
Supervisory Patent Examiner, Art Unit 1791